

FRESH AIR TREATMENT  
IN HOSPITAL WARDS.

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## FRESH AIR TREATMENT IN HOSPITAL WARDS.\*

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VISITING PHYSICIAN TO THE PRESBYTERIAN AND BELLEVUE HOSPITALS.

THE general medical hospital ward as exemplified in most of the hospitals in this city is a most uncomfortable and irrational place for the proper care of the sick. In the same long, narrow room are crowded a miscellaneous collection of ailments, all submitted to identical conditions and surroundings, without the slightest attempt at appropriate adaptation of environment. The pneumonia patient, with a temperature of  $105^{\circ}$  F., sorely in need of fresh, cool air, lies in the next bed to the uremic patient with a subnormal temperature and high tension pulse, who needs warm air and a hot pack! The typhoid fever patient, with a racking headache and photophobia, lies facing a glare of sunlight, which is doubtless beneficial to the man with pernicious anemia in the next bed (because the trained nurses think the ward looks better with the shades all at the same height). The neurasthenic with insomnia lies next to the patient with alcoholic cirrhosis and delirium tremens, who keeps the entire ward awake most of the night. The convalescent patient has nowhere to go during the day for a change of air and scene, and the poor old

\*A paper read before the New York Academy of Medicine, January 17, 1907.

woman with a little chronic cough, who needs to rest in an easy chair toasting her feet at a heater, sits gazing wistfully and pathetically at a hole in the wall near the ceiling, where some architect (who never built a hospital before) has seen fit to place a hot-air register. But these are minor inconsistencies. The greatest evil of all is that the ward is "ventilated" by a thermometer, a little instrument which from October to May is kept steadily at 68° or 70° day and night, without regard to the moisture of the air, its freshness, its CO<sub>2</sub> content, its nitrogenous waste, its pollution with fetid odors, emanations from foul stools, foul breaths, and foul perspirations. Without regard also to the fact that during the visiting hours, or during the admission of classes of students or probationer nurses, the ward air, which ought to belong primarily to the patients, has been breathed for them by double and sometimes treble their number of outsiders. In some very much "up-to-date" institutions, the thermometer is replaced by an electric thermostat, communicating its valuable data to the superintendent's office, so that he may rest assured that in the wards above the air is always at 70° F., no matter if it is 15 per cent. CO<sub>2</sub> or hydrogen sulphide, for all he knows. The functionary usually placed in charge of this ingenious system is the hospital engineer, who is about as much of a ventilation expert as a hibernating dormouse. The nurses (who are given elaborate lectures on hygiene, and "how to ventilate the sick-room") are not allowed to raise a window as much as a crack from October to May, and as for the house staff—why, of course it is not for mere doctors to stoop to such details! One of our representative hospitals in which that most pernicious of all ventilating systems, known as the "closed system," was placed some eighteen

years ago, with the endorsement of the Medical Board and at extraordinary cost, originally had locks and keys attached to its windows, and in lavatories the windows were, in addition, screwed down with bolts! Would anyone of us consent to live from October to May in a house in which his bedroom windows were locked fast and his lavatory window screwed to the sill? But we are in and out, getting the stimulus of a *change* of air, a change of temperature, as well as of air composition. The bed-ridden patient, on the other hand, lies perpetually at the mercy of the superheated air which is supplied him. The fundamental fault of the "closed ventilation" system is that heating and ventilation are made inseparable, and to deliver through long conduits air hot enough to warm a large number of distinct wards, it must be first superheated to about 400° F. and then all doors and windows must be kept tightly closed, for the opening of a single window in one ward "short-circuits" the entire system, and temporarily cuts out all the wards from both heat and air supply. This system may work in large assembly halls, such as churches or theaters, but there it is not continuous, and the people come and go, and refresh themselves with normal outdoor air. Superheated air is like superheated or sterilized milk—one can live upon it, of course, but there is nothing "uplifting" about it (as Walter James has said, in writing on this topic), and it admits of no advancement in health. I am convinced that there are properties which, for lack of better term, we call "vital" in the outdoor air that are not measurable by any of our present instruments of precision, such as the thermometer, hygrometer, thermostat, barometer, etc. It is only a few years since it was supposed that all was known about the chemical composition of atmospheric air. Then

argon and other new elements were discovered. It is not unreasonable to believe also that some of the physical properties of the air are more or less permanently altered by its confinement and superheating.

Being unable to find any recorded scientific data upon the quality of hospital ward air, I undertook to obtain some a year ago in the wards of the Presbyterian Hospital. A study of the  $\text{CO}_2$  content of the wards was made under varying conditions. The analyses were performed for me by Dr. C. G. L. Wolf (Instructor in Chemistry and Physics in the Cornell University Medical College in New York City), and the results were very illuminating. The experiments were carefully made, unusually large quantities of air were used to lessen liability to error, and control tests were made upon the hospital roof air and that of Dr. Wolf's laboratory, in which the chemical analyses were conducted. Without going into details, I will quote briefly from the conclusions of our report, which was submitted to the managers of the hospital: (1) Pure, normal atmospheric fresh air is admitted to contain 4 volumes of  $\text{CO}_2$  per 10,000 volumes of air; 4.5 parts  $\text{CO}_2$  represent highly impure air, 5 parts injurious air, and 6 to 7 parts air wholly unfit to breathe. (2) When the fresh air on the roof was practically normal (4.06 parts  $\text{CO}_2$ ) that in the wards, with the most complete closed ventilation system in full operation, contained as much as 4.71 parts  $\text{CO}_2$ , and after twenty visitors and four nurses had spent one hour in the ward this content rose to 5.13 parts. Immediately thereafter the ward windows were opened for ten minutes only, and the  $\text{CO}_2$  content fell to 4.34 parts, although on a cold December day the ward temperature was lowered thereby only  $3^\circ$  F. Hence, with almost impercep-

tible change, as shown by the pernicious thermometer, the air impurities, which had been increased more than 20 per cent. by the visitors, were nearly eradicated by ten minutes of *window opening*. (Truly the nose is mightier than the thermometer as a ventilation guide!) (3) Of course the CO<sub>2</sub> content is only one of the many forms of atmospheric vitiation, but it is known to rise and fall *pari passu* with other impurities, and is therefore a fair index of the other conditions of vitiation. (4) In connection with these experiments others were made by Dr. G. A. Tuttle in the bacteriological laboratory of the hospital to demonstrate the injurious effect of raising dust by dry sweeping, so common in American hospitals. On an exposed agar plate 26 colonies of bacteria were deposited in quiet ward air. When the air was agitated by dry sweeping the number rose to 532 colonies, or more than twenty times as many colonies of streptococci, staphylococci, diplococci, with spores, fungi, and a variety of miscellaneous organisms. This was in a ward thoroughly cleaned every day.

Several years ago, while simultaneously visiting in two hospitals, I observed a very striking difference in certain classes of patients, especially those with marked anemias, chronic sepsis, pulmonary and chronic cardiac diseases, etc. In one the patients were supplied solely with superheated air forced through thousands of feet of metal conduits, and during their entire stay in hospital never received one single breath of unbaked air. Some of them improved, others grew well, to be sure, but they were a very long time about it. The other hospital is one of our oldest. The windows have settled, gusts of air and even the snows blow in through wide cracks. The wards are heated by steam pipes, and when too hot or too close the

windows are opened, and even in midwinter are sometimes left open all day. Each patient receives good daily allowance of pure, fresh, unroasted air. The difference was really very striking in the greater promptness of recovery in favor of the old, tumble-down hospital that used to be an almshouse ninety odd years ago. It was so striking that we sought to do better, and as the old almshouse is the only hospital in this entire city that has adequate balcony accommodations attached to the wards we began to move the patients' beds out on the verandas. First the tuberculous were moved out, later the pneumonias, and later still any case that could be distinctly benefited by air which had never been in anyone else's lungs. At the Presbyterian Hospital we have as yet no balconies; but we have small rooms opening off the wards. In these we have sealed up the artificial ventilation system so that the windows may be kept open day and night, and a patient at the corner of Madison avenue and Seventy-first street who is dying for lack of fresh air, can get it without freezing out a surgical patient on the corner of Park avenue and Seventy-first street by short-circuiting his air supply! In these small rooms, as far as their capacity admits, we now place all those needing uncooked air, and the effect in certain cases is truly magical. We have made further improvement in the wards themselves by requiring that the windows be simultaneously opened widely at least twice a day to thoroughly air the ward, like any other bedroom, and by requiring that the night temperature be kept five degrees lower than that of the day, for there is something stimulating to respiration in such change which is lacking at the monotonous 70° F. level.

The most striking benefit of the uncooked air treatment is shown in cases of pneumonia. Deliri-



ous alcoholic patients, with profound cyanosis, when taken out of the general ward and placed at windows open day and night, become much less nervous and restless, and distinctly less cyanosed. I formerly gave such patients oxygen sedatives, whiskey, and other stimulants. In the open air they, of course, receive no oxygen, and require far less of stimulants and sedatives. During 1906 we treated in all at the Presbyterian Hospital 128 cases of acute lobar pneumonia. Of these patients 47, or 36.7 per cent., received absolutely no drugs whatever—no stimulants, no narcotics, no inhalations, no “specifics.” nothing except the occasional laxative, which anyone in bed with fever may require, and they all recovered, in the usual way, when the time came. Some defervesced by crisis, some by lysis, some in five days, some in 12 days, or other intervals. A large proportion of these patients received the uncooked air treatment and enjoyed it. The air temperature was often as low as 35° F. or 40° F. They never complained, except when some emergency required them to be taken back to the ward, as when the room was needed for some other patient in more urgent condition. They were not all thus treated merely from lack of sufficient isolation rooms or balconies. The remaining ward patients who recovered received various drugs or stimulants, solely because certain complications arose which needed treatment. But I would again emphasize the fact that of 128 patients with pneumonia, 36.7 per cent. made complete recovery in the usual time, without any medication, and for the most part with their heads lying close to open windows in midwinter weather.

Other diseases that do remarkably well with open window treatment are cerebrospinal meningitis, chronic sepsis, and all forms of anemia. The menin-

gitis patients become very much quieter, sleep much better, and look better in every way. A patient with a pernicious anemia in which the red blood corpuscles numbered only 828,000 gained over a million red cells in a week when I took her out of the general ward and placed her in a small room with wide open windows. She left the hospital a few weeks later, with over 4,000,000 red cells, and a hemoglobin estimation that had risen from 20 to 80 per cent.

When the pneumonia or other febrile cases require a cold bath, or the use of a bedpan, or any procedure necessitating exposure, they are temporarily taken into the ward, or the windows of their rooms are closed, and the rooms warmed.

All this is nothing new, but it is well sometimes to preach again from old and well established texts. Forty-two years ago there was an epidemic of typhus and typhoid fever in New York City. As the wards of Bellevue Hospital became overcrowded, 520 patients were transferred to Blackwell's Island and placed outdoors under tents, in the late autumn and early winter. Dr. Austin Flint in his *Practice of Medicine* (5th ed., p. 978), in writing of this incident stated: "The average death-rate in the hospital wards was 1 in 5.97; in the tents 1 in 16.77." "Making the fullest allowance for the conjecture that the cases in the tents were milder than those in the hospital wards, it can hardly be doubted that the superior ventilation in the tents was the means of saving many lives." Fifty-six years ago Dr. John H. Griscom reported in this Academy the treatment by open air in Perth Amboy, New Jersey, of 82 cases of typhus fever. The patients who were derived from an immigrant ship, had the additional advantage of being soaked by a thunder shower, and all made good recovery from the fever.

(Flint, *loc. cit.*) Eighteen years ago, during a reconstruction of the Presbyterian Hospital after the fire, I treated a number of cases of erysipelas, with high fever, in open tents on the hospital grounds, with excellent results. Every midwinter army campaign in which the sick and wounded have had tent treatment has shown anew the advantages of outdoor air. In answer to those who object to giving a pneumonia patient first-hand, unbreathed, uncooked air (and such objectors have usually never seen the treatment tried), it should be stated that this form of treatment is not a temporary fad or a "fresh-air crusade," but a very old, well tried, and widely tried, common-sense method, from which we have been somewhat led away of recent years. The undesirable necessity of building large metropolitan hospitals of the "sky-scraper" type, the idea of massing all manner of heterogeneous cases with a series of long wards, all precisely the same, like sheep corrals, and the inhumanity of architects, who strangely prefer mansard roofs and straight ornamental façades to roof gardens and ward balconies, pernicious application of wholesale ventilation "systems" for the air supply of the air-hungered—these are some of the factors which have led us to turn from the open window and fix our exalted gaze upon the cast iron heater in the wall!

In Continental Europe they are far ahead of us in modern hospital construction in many different countries. Closed ventilation systems are practically unknown. Windows are built with transoms of different sizes, permitting easy regulation of the ward air. Heaters, porcelain stoves, and even open fires, are placed where patients who feel cold and need warmth may sit and be comforted. Numerous small rooms of variable sizes admit of the scientific classification of patients, especially as regards their

individual requirements for ventilation and air temperature (two essentially different things). Attractive day rooms are provided next the wards, so that convalescents not only obtain change of air, scene, and occupation, but leave fresher air in the wards for the benefit of the very ill. Many visitors are thus kept out of the wards by being admitted to the day rooms instead. The evil of dry sweeping in the wards is unheard of. Finally, broad, open corridors abound, and attractive grounds, with shelter tents, are so arranged that patients have free access to them at all times. In all these things we have very much to learn, especially just now, while propositions are already before us to spend \$29,000,000 (see MEDICAL RECORD, January 5, 1907, Stephen Smith on "A Hospital System for New York") of the taxpayers' money for new public hospitals.

I have purposely thus far omitted mention of tuberculosis, because the object of this meeting is to stimulate interest in the application of fresh air—not necessarily cold air, but always *fresh* air—treatment to a very large variety of other diseases. Tuberculosis has demonstrated for us that fresh air acts not as a specific for any one disease, but by increasing the resisting power of the organism against many diseases. To this end we should learn to adapt our modern hospital construction as well as that of our own homes.

The following conclusions for the betterment of ward ventilation in this cold and very changeable climate are submitted:

1. Ward heating and ward ventilation should be capable of independent adjustment at all times.

2. The night temperature of the ward should be at least 5° F. below the noon day temperature, which latter should not be above 68° F. or 70° F.

3. The ward windows should be furnished with transoms and one or two movable separate panes, to admit of easy regulation and ventilation.

4. No window should be so heavy that it cannot be readily handled by the nurse.

5. The ward should be in communication with balconies or porches, on to which patients' beds can be moved through windows of the casement type. Such balconies need not interfere with the adequate lighting and ventilating of the ward, as proved at the Bellevue and other hospitals in which they have been used. (They are being put upon all the wards of the new Bellevue).

6. The building of very large wards should be discouraged and a greater number of small adjacent rooms should be provided to admit of the scientific adjustment of the ventilation and temperature to suit the requirements of different patients.

7. The windows of the ward, even on the coldest day, should be opened at least twice daily, in the early morning and late afternoon, for a few minutes to thoroughly change all the air in the room. During this time any patient may be covered temporarily with extra bed clothing if there be fear of exposure from draft. The same procedure should be carried out immediately after visiting hours.

8. Day rooms should be provided for convalescents where they can obtain change of air and scene, and leave more fresh air for the bedridden patients in the wards.

9. The ward should have at least one *accessible* heater, where patients temporarily sitting up may gather and warm their feet if desirable.

10. It is entirely unnecessary to have all the ward windows precisely alike, except from some fanciful esthetic standpoint. Thus certain windows of the casement type should spring from the floor and give

on to balconies. Obviously heaters cannot stand in front of these windows as they should in front of other shorter windows of the ordinary height. Windows should be grouped with more reference to sunlight exposure, ordinary wind exposure, etc., than is usually done.

II. House staff and nurses should not only be taught ventilation theoretically, but made to put it into practice in the wards, and should be made to regard fresh air as of equal importance with fresh food.

Where these simple common-sense principles are in daily practice it is possible to use fresh air as a definite therapeutic means and secure most gratifying results. Finally, air temperature and ventilation are *not* synonymous terms!

34 EAST THIRTY-FIRST STREET.